



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,450	03/19/2004	Paul J. Daniels	SC13292ZC	7280
23125	7590	01/10/2006	EXAMINER	
FREESCALE SEMICONDUCTOR, INC. LAW DEPARTMENT 7700 WEST PARMER LANE MD:TX32/PL02 AUSTIN, TX 78729				BEHM, HARRY RAYMOND
		ART UNIT		PAPER NUMBER
		2834		

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/804,450	DANIELS ET AL.	
	Examiner	Art Unit	
	Harry Behm	2838	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 19 March 2004.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-5, 7-16 and 18-20 is/are rejected.
- 7) Claim(s) 6 and 17 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 19 March 2004 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>3/19/04</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: In Fig. 1 the comparator labeled 24 should be labeled 28. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: Paragraph 12 references resistor 38 instead of resistor 28.
3. Appropriate correction is required.

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
5. The following title is suggested: Detecting overcurrents in a switching regulator by integrating the sensed current and comparing to a reference that depends on the input and output voltages.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
7. Claims 1, 3-5, 9-13, 15, 16 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Sanzo (US 6,570,748).
8. With respect to Claim 1, Sanzo discloses an active circuit (Fig. 2 100) for being coupled to a reactive circuit (Fig. 2 14) that provides an output voltage (Fig. 2 LOAD Voltage), comprising: a control regulator circuit (Fig. 4 254) having an output for providing pulses (Fig. 4 244); a first switch (Fig. 2 S1) that has an input (Fig. 2 128) coupled to the output of the controlled regulator, a power supply input (Fig. 2 Vin) coupled to a power supply terminal, and an output (Fig. 2 Vstore) that is an output of the active circuit; a pulse shaper (Fig. 2 16) having an

input coupled to the control regulator and an output (Fig. 2 Vmonitor); a reference voltage generator (Fig. 3 129) for providing a reference voltage (Fig. 2 Vref1) that changes in response to changes in a voltage at the power supply terminal (paragraph 6 “threshold is dependent on the supply voltage”); and an integrator (Fig. 3 108, 127) having a first input coupled to the output (Fig. 3 Vmonitor) of the pulse shaper, a second input for receiving the reference voltage (Fig. 3 Vref1), and an output (Fig. 2 Vstore) for providing a signal indicative of a current level supplied at the output voltage (Fig. 2 LOAD voltage).

9. With respect to Claim 3, Sanzo discloses the active circuit of claim 1, wherein the reference voltage generator (Fig. 3 V1,V2,168) is responsive to a first programming signal (Fig. 3 Vref2) in addition to being responsive to the voltage (Fig. 2 Vin) at the power supply terminal.
10. With respect to Claim 4, Sanzo discloses the active circuit of claim 3, wherein the reference voltage generator (Fig. 3 V1,V2,168) is responsive to a second programming signal (Fig. 3 Voffset).
11. With respect to Claim 5, Sanzo discloses the active circuit of claim 3, wherein the first programming signal (Fig. 3 128') is representative of the output voltage (Fig. 2 LOAD voltage).
12. With respect to Claim 9, Sanzo discloses the active circuit of claim 1, wherein the integrator comprises: a voltage-to-current converter

(Fig. 3 127, 172,176) having a first input (Fig. 3 +) coupled to the output of the pulse shaper (Fig. 3 Vmonitor), a second input (Fig. 3 -) to the output of the reference voltage generator (Fig. 3 V1), and an output (Fig. 3 144); and a capacitor (Fig. 3 136) coupled to the output of the voltage-to-current converter.

13. With respect to Claim 10, Sanzo discloses the active circuit of claim 1, wherein the first switch (Fig. 3 16) comprises an N channel transistor (paragraph 4 “N-channel field effect transistor”).
14. With respect to Claim 11, Sanzo discloses a method of operating an active circuit as a portion of a switching regulator, comprising:
providing current pulses (paragraph 4 “switching current pulses through an inductor”) of a first type based on a supply voltage (Fig. 2 Vin) for use in providing an output voltage (Fig. 3 LOAD voltage);
providing voltage pulses (Fig. 4 244) representative of the shape of the first type of current pulses; providing a reference voltage (Fig. 3 Vref1) that is related to the supply voltage (Fig. 2 Vin) and an indication of the output voltage (Fig. 3 LOAD voltage); generating current pulses of a second type based on a comparison (Fig. 3 127) of the reference voltage (Fig. 3 Vref1) and the voltage pulses (Fig. 3 128’); and integrating (Fig. 3 136) the current pulses (Fig. 2 Vmonitor) of the second type to generate a signal indicative (Fig. 2 Vstore) of a current level (Fig. 2 LOAD current) supplied at the output voltage.

15. With respect to Claim 12, Sanzo discloses the method of claim 11, wherein the integrating is performed by a capacitor (Fig. 3 136) from which current is removed (Fig. 3 176) and into which current is supplied (Fig. 3 172) during the integrating.
16. With respect to Claim 13, Sanzo discloses an active circuit, comprising: pulse means (Fig. 4 244) for generating current pulses (Fig. 2 S1 current) from a supply voltage (Fig. 2 Vin) for use in providing a DC output voltage (Fig. 2 LOAD voltage); replication means, coupled to the pulse means, for generating pulses representative of the current pulses (Fig. 2 S1 current); reference means for providing a reference voltage (Fig. 3 Vref1) based on information as to the DC output voltage (Fig. 3 LOAD voltage) and the supply voltage (Fig. 3 Vin); comparator means (Fig. 3 127), coupled to the replication means and the reference means, for generating current pulses (Fig. 3 132), wherein each pulse has an amount of charge related to the reference voltage (Fig. 3 Vref1); and a capacitor (Fig. 3 136) for receiving the current pulses.
17. With respect to Claim 15, Sanzo discloses the active circuit of claim 13, wherein the information as to the DC output voltage (Fig. 2 LOAD voltage) is a first programming signal (Fig. 3 128').
18. With respect to Claim 16, Sanzo discloses the active circuit of claim 15, wherein the reference means (Fig. 3 129) is responsive to a

second programming signal (Fig. 3 Voffset). Paragraph 8 "the offset voltage source 168 is used to adjust the voltage applied to the terminal ... one skilled in the art can see that other compensation techniques can also be used".

19. With respect to Claim 19, Sanzo discloses the active circuit of claim 13, wherein the replication means comprises: a transistor (Fig. 2 16) coupled to the pulse means; and resistor means (paragraph 3 "Rds") for being coupled between the transistor (Fig. 2 16) and the supply voltage (Fig. 2 Vin).

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. Claims 2 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sanzo in view of Morris (US 4,017,789).
22. With respect to Claim 2, Sanzo discloses the active circuit of claim 1 and 13 as above. Sanzo does not disclose the use of a Schmitt trigger having an input coupled to the output of the integrator. "[Overcurrent protection circuits] for switching regulators usually employ a circuit such as a Schmitt-trigger" Morris paragraph 2. Morris

teaches the use of a Schmitt-trigger which is used to detect variation in the output load. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Schmitt-trigger at the output of the overcurrent integrator. The reason for doing so is to provide hysteresis which creates cleaner threshold transitions.

23. Claims 7, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sanzo in view of Hosakawa (US 5,903,422).

24. Sanzo discloses the active circuit of claim 1 and 13 as above. Sanzo does not disclose a crowbar switch coupled to the control regulator circuit and a crowbar comparator coupled to the crowbar switch, nor does he disclose wherein the reference means comprises three current sources and a resistor. Hosakawa teaches that it is well known in the prior art to use a crowbar switch (Fig. 2 45) coupled to the control regulator circuit and a crowbar comparator (Fig. 2 43) coupled to the crowbar switch, and wherein the reference means comprises three current sources (Fig. 1 24, 27 and 30) and a resistor (Fig. 1 28). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a dedicated transistor, sense resistor and comparator to create for the purpose of detecting hard shorts and it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate another dedicated transistor for the purpose of sensing the current to detect a softer short.

25. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sanzo in view of Wang (US 6,670,794).
26. With respect to Claim 8, Sanzo discloses the active circuit of claim 1, wherein the pulse shaper comprises: a first transistor having a control electrode coupled to the output of the control regulator circuit, a first current electrode coupled to the output of the first switch, and a second current electrode. Sanzo does not disclose a first resistor having a first terminal coupled to the second current electrode of the first transistor and a second terminal coupled to the power supply terminal, but it is common to sense the resistance across the FET instead of using a sense resistor. Wang discloses it is possible to sense the current through the FET using a sense resistor (Fig. 2A) or using the resistance of the FET (Fig. 2B). It would have been obvious to one of ordinary skill in the art at the time of the invention to measure the current flowing through the FET using a sense resistor instead of measuring the resistance of the FET, for the reason of having a simpler design where the resistance does not need to be measured only during the on time.

Allowable Subject Matter

27. Claims 6 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent

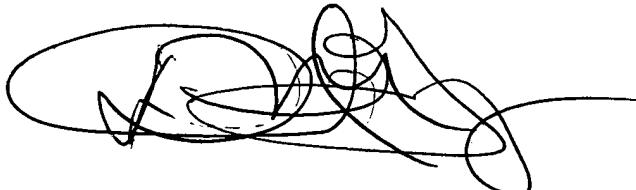
form including all of the limitations of the base claim and any intervening claims.

28. The following is an examiner's statement of reasons for allowance:
the prior art does not disclose updating the reference voltage directly with the output voltage.
29. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Shimamori (US 6,911,808) teaches updating the overcurrent threshold as a function of the output voltage. Cooke (US 5,710,697) teaches charging a capacitor and creating a duty cycle as a function of the output and supply voltages. Grimm (US 6,400,544) and Usui (US 6,760,203) disclose charging a capacitor to detect an overcurrent using a fixed reference level.
31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry Behm whose telephone number is 571-272-8929. The examiner can normally be reached on Business EST.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Gray can be reached on 571-272-2119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
33. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David Gray
Primary Examiner